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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/735,009	12/12/2000	Charles E. Boardman	24-BR-6010	3389

7590

03/19/2002

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EXAMINER

PALABRICA, RICARDO J

ART UNIT

PAPER NUMBER

3641

DATE MAILED: 03/19/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/735,009

Applicant(s)

BOARDMAN ET AL.

Examiner

Rick Palabrica

Art Unit

3641

-- The MAILING DATE of this communication appears on the cover sheet with the corresponding address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 11 January 2002.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-11 and 25-33 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-11 and 25-33 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- 4) ☐ Interview Summary (PTO-413) Paper No(s) _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

1. Applicant's amendment in Paper No. 5, wherein new claims 25-35 were added and Group I (claims 1-13 and 25-33) was elected with traverse, is acknowledged. Said amendment is in response to Office Action dated January 11, 2002.
2. Applicant traversed the restriction requirement on the grounds that inventions I and II are not distinct and that search and examination of the two groups will not be a burden. These arguments are not found persuasive for the reason previously stated in said Office Action, i.e., the two groups have different classifications. As to the traverse on the grounds that the two inventions are not distinct because the apparatus cannot be used to practice another and materially different process, this is also not persuasive. As again stated by the examiner in said Office Action, the apparatus can be tapped for conversion of coal to liquid hydrocarbons. Note that part of the high temperature steam exiting from the topping heater can be utilized for said alternative process. Accordingly, the election requirement is still deemed proper and is therefore made **FINAL**.

Specification

3. The disclosure is objected to because of the following informalities:
 - On page 2, line 13 and page 4, line 19, the word "toping" should be "topping."

- On page 4, line 7, the comma between "steam" and "generator" should be deleted.

Appropriate correction is required.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 1-11 and 25-33 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 4,576,783 to Koutz (see figure and corresponding parts of the specification). Koutz discloses the applicant's general inventive concept of augmenting the temperature of a working fluid heated by a nuclear reactor so as to provide the temperature necessary to carry out thermal decomposition of water to produce hydrogen (see column 1, 2nd paragraph and column 2, lines 30-33). However, Koutz does not disclose the use of a liquid metal reactor and a gas heater to raise the temperature of the feedwater heated by a liquid metal reactor, or the inclusion of a desalination plant in the system.

Koutz discloses a high temperature gas cooled reactor with a reactor core (12) that heats the radioactive, primary coolant to approximately 1350°F. There is a non-radioactive, secondary loop (22) that contains a working fluid (gas) flowing through an

intermediate heat exchanger (20) that raises the temperature of said fluid to approximately 1200°F. A heat pump (28) further raises the temperature of said working fluid to 1500°F prior to flowing through a process chamber (30) where said fluid supplies the heat to produce hydrogen by thermal chemical water splitting. Koutz teaches that light water reactors cannot be operated at a temperature range enabling their practical use as a source of heat for chemical processes, such as thermal decomposition of water to produce hydrogen because of the required relatively high process temperatures, i.e., in the range of 1200°-1800°F. For this reason, he uses a high temperature, gas cooled reactor. (Note that said working temperature range disclosed by Koutz is consistent with applicant's stated temperature of at least 850°C (1562°F) for the claimed inventive concept). Koutz also discloses a steam turbine that drives an electric generator (see column 3, lines 27-30). Koutz further teaches the use of at least three regenerative heat exchangers in his system (see, for example, column 2, lines 55-59; column 3, lines 20-25).

As to the specific limitation in said claims regarding the specific reactor type, it is well known in the nuclear art that sodium-cooled, liquid metal reactors have higher operating temperatures (about 950°F or 510°C) than water-cooled reactors (see, for example, U.S. Patent 5,030,411 to Cooper). These reactors typically include three fluid circuits for extraction of nuclear heat generated, with the first and second fluid circuits involving sodium and the third circuit involving feedwater in a steam cycle.

Art Unit: 3641

As to the specific limitation in the claims regarding gas-fired heaters, they are also well known in the art as heat sources. They typically operate at combustion or flame temperatures of about 900°C.

As to the specific limitation in the claims regarding the regenerative heat exchangers, their use to conserve energy by usefully extracting excess heat is a well-known expedient in the art. Said heat exchangers are conventionally used to transfer heat from an expanded working fluid to heat another working fluid.

As to the use of exhaust heat from the gas heater in a desalination plant, such an application is well known in the art of coupling nuclear power reactors with a plurality of electrochemical devices, including desalination of sea water (see, for example, BNL 959 (T-399), "The Impact of Integrated Multipurpose Nuclear Plants on the Chemical and Metallurgical Process Industries").

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to apply conventional knowledge to modify the system, as disclosed by Koutz, by substituting a liquid metal reactor for the high temperature gas cooled reactor, a gas heater for the heat pump, and a steam generator for the intermediate heat exchanger, as well as use regenerative heat exchangers to take advantage of excess heat from the gas heater to raise the feedwater temperature and be an input to a desalination plant, in order to have an alternative method of producing high temperature, chemical process heat for a plurality of industrial applications, using a nuclear reactor type that does not have the disadvantages of low operating temperatures of a water-cooled reactor.

Conclusion

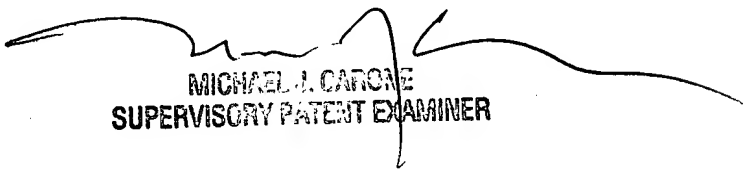
6. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. References B and V pertain to the use of nuclear reactors as a source of process heat and are relevant to the inventive concept of the application.

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Rick Palabrica whose telephone number is 703-306-5756. The examiner can normally be reached on 8:00-4:30, Mon-Fri.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Carone can be reached on 703-306-4198. The fax phone numbers for the organization where this application or proceeding is assigned are 703-305-0285 for regular communications and 703-305-0285 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-1113.

RJP
March 11, 2002.


MICHAEL J. CARONE
SUPERVISORY PATENT EXAMINER